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Tunable Dispersion of Carbon Nanotubes in Water using pH-Responsive Polymers KRISHNA ETIKA, Materials Science and Engineering Program, Texas A&M University, College Station, TX, MICHAEL COX, Texas A&M University, College Station, TX, JAIME GRUNLAN, Materials Science and Engineering Program, Texas A&M University, College Station, TX — In an effort to control the level of carbon nanotube exfoliation in water, pH-responsive polymers (i.e, weak polyelectrolytes) have been used as stabilizers in water. This noncovalent functionalization of single-walled carbon nanotubes (SWNTs) results in suspensions whose dispersion state can be altered by simply changing pH. In this study poly(acrylic acid), poly(methacrylic acid), poly(allylamine) and polyethleneimine were used to stabilize aqueous SWNT suspensions. The results indicate that SWNTs stabilized with these polymers show a pH tailorable exfoliation and bundling in water, as evidenced by cryo-TEM images and shifts in suspension viscosity. Composite films prepared by drying these aqueous suspensions suggest that nanotube microstructure in the liquid state is largely preserved in solid composites, with more bundled/networked structures showing higher electrical conductivity. A stabilization mechanism based upon the results obtained is proposed to explain the exfoliation and aggregation behavior of SWNTs. This method of controlling the microstructure of SWNTs in liquid state with pH could have a significant impact on the ability to tailor the microstructure and properties of composites.

Jaime Grunlan
Texas A&M University, College Station, TX

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